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(54) DOSAGE COUNTING DEVICES
DOSENZAHLERHICHTUNGEN
SYSTEME DE COMPTAGE DES DOSES

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Description

[0001] The present invention relates to counting devices for use with dose-dispensing delivery apparatus which require an axial force for operation.

[0002] It has been recognized that there is a need to provide accurate information to the user of a dose-dispensing delivery apparatus concerning the number of doses delivered from, or remaining in, the apparatus. Without such accurate information there is the danger that a user will forget how many doses have been delivered and hence take a greater or fewer number of doses than is required. There is also the danger that a user may be unaware that the delivery apparatus is empty or close to empty. Hence, in an emergency situation, the user may seek to take a dose from the delivery apparatus only to find that there are no doses left in the apparatus. This is especially dangerous where the delivery apparatus is for use in dispensing medicinal compounds for the treatment of chronic or acute symptoms, for example, as in the case of a pressurized metered dose inhaler used for treating asthma.

[0003] A number of devices have been proposed to count the number of doses delivered or remaining in a delivery apparatus. EP0450482 discloses a dose-counting device that comprises elastic means suitable for transforming the translatory motion of an operating member with respect to the drug unit in a rotary and axially reciprocating motion of a rotating and axially translatable element provided with numerical indices. Said elastic means comprising a succession of small flexible circumferentially distanced legs having an upper part suitable for reacting with a first set of one-directional teeth of the operating member, a lower part suitable for reacting with a second set of one-directional teeth of the ring nut and an intermediate part fastened to the rotating element, so that when said first set of one-directional teeth under the action of said operating member, the upper part (14) of said small legs disengages from the corresponding tooth of the first set of teeth to be inserted in an immediately adjacent tooth and thus driven in rotation and axial forward movement said intermediate part of the small leg and when said first set of teeth is moved away from said second set of teeth, when the lower part of said operating member is rotated, the intermediate part of each leg disengages from the corresponding tooth of the second set of teeth to be inserted in an immediately adjacent tooth and thus driven in rotation and axial backward movement said intermediate part of the small leg.

[0004] EP1055477 describes a dose dispenser with a device for counting the dispensed doses, wherein the dispenser comprises a base body, an operating body superimposed on the base body, a first disclosed body housed in and rotatable within the operating body, and wherein flexible tangs projecting on the first disclosed body cause the first disclosed body to rotate one step each time the operating body is moved axially relative to the base body. WO9508484 teaches a dose counting

device for use with an aerosol medication dispenser. The device works by translating a non-rotative force on an outer cover into a rotation of an indicator wheel by use of a set of flexible paws engaged with a set of teeth. The paws depress and thereby extend circumferentially when the applied force forces them to effect a rotation of the teeth. This device has, however, been found to have disadvantages. The reliability of operation of the counting device depends on the relationship between the stiffness of the internal spring bias of the medication dispenser and the paws. If the paws are too stiff relative to the internal spring bias then the medication dispenser may dispense a dose before the paws flex sufficiently to rotate the indicator wheel. A dose would be dispensed without the indicator registering it. Alternatively, if the paws are too flexible relative to the internal spring bias then the paws may flex sufficiently to rotate the indicator wheel before the medication dispenser has dispensed a dose; a dose would be registered by the counter but not actually delivered.

[0005] The present invention seeks to provide a dosage counting device which overcomes these problems.

[0006] Accordingly, the present invention provides an apparatus comprising a housing defining a portion for receiving a dose-dispensing container, the housing containing a dose counter comprising at least one annular counter member, a helix-like coil and a separate transmission means for operatively connecting the helix-like coil and the at least one annular counter member, wherein in movement of the received dose-dispensing container acts to compress the helix-like coil to thereby rotate the transmission means and the at least one annular counter member.

[0007] An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional view of a dispensing apparatus according to the present invention; and Figure 2 is an exploded perspective view of part of the dispensing apparatus of Figure 1.

[0008] In the following description, the invention will be illustrated by way of example only, with respect to a pressurized dispensing container for delivering successive doses of a product in an aerosol form.

[0009] Figures 1 and 2 illustrate a dispensing apparatus according to the present invention.

[0010] The dispensing apparatus comprises a housing 1 having a cylindrical portion 2 with upper and lower ends. The upper end 6 is open whilst the lower end is closed off by a basal wall portion 7. A mouthpiece 3 which communicates with the cylindrical portion 2, depends laterally from the lower end of the cylindrical portion 2. The mouthpiece 3 defines an outlet duct 4 which terminates in an outlet 5 of the mouthpiece 3.

[0011] An inwardly directed valve seat 603 is integrally formed with the basal wall portion 7 and

has its longitudinal axis aligned co-axially with a longitudinal axis of the cylindrical portion 2 of the housing 1. The valve stem receiving block 9 defines a receiving bore 12 which is open to the cylindrical portion 2 and an orifice 10 which is open to the outlet duct 4 of the mouthpiece 3. The receiving bore 12 and orifice 10 are linked by a duct 11.

[0012] Eight circumferentially spaced inwardly directed longitudinal ribs 12 are provided on the internal wall of the cylindrical portion 2.

[0013] In use, a pressurised dispensing container 20 is received in the cylindrical portion 2. The pressurised dispensing container 20 comprises a canister body 21 defining a storage chamber for housing the product to be dispensed. The canister body 21 is closed off at one end and by a mating valve (not shown) having a valve stem 22 which extends externally from the mating valve. The mating valve is retained in the canister body by a crimped female 23.

[0014] When the pressurised dispensing container 20 is inserted into the housing 1, the valve stem 22 is received in receiving bore 12 of the valve stem receiving block 9. An annular air gap 13 exists between the internal wall of the cylindrical portion 2 and the canister body 21 to allow air to flow through the dispensing apparatus in use.

[0015] According to the present invention, a dosage counter comprising a first and second indicator wheels 141, 142, a helical coil 143, drum 144 and support 145. The first and second indicator wheels 141, 142 comprise indicia 147 marked on their peripheral walls. The first indicator wheel 141 denotes numerical 'unit' and the second indicator wheel 142 denotes numerical 'tent'*. Each indicator wheel 141, 142 is annular.

[0016] Each indicator wheel 141, 142 comprises a series of external teeth 148, 151 arranged around an upper half of the external rim of the annulus. In addition, each wheel 141, 142 comprises a series of internal teeth 149, 152 arranged around a lower half of the internal rim 200 of the annulus. The first indicator wheel 141 also comprises two diametrically opposed radial notches 150 on the upper half of the internal rim 200 of the annulus. More than two notches 150 may be provided.

[0017] The helical coil 143 comprises an upper ring 153 and a lower ring 154 which are interconnected by two flexible helical struts 155. The upper ring 153 comprises four equispaced radially outwardly directed protrusions 156.

The struts 155 define a central longitudinal rib 157.

[0018] The drum 144 comprises a generally cylindrical body 145 having two diametrically opposed pairs of upper and lower helical arms 150, 153 depending therefrom. An internal surface of the body 145 comprises four longitudinal recesses 158.

[0019] The support 145 comprises a generally annular base 159 from which extends upwardly a central spigot 160 and three equal-spaced circumferentially arranged guide arms 169. The spigot 160 is shaped to form

a key 164. Each of the vertical guide arms 169 comprises an inwardly directed flange 170 at its upper, distal end. [0020] A lens unit 171 is provided dependent from the support bore 12.

[0021] A lower reticent 165 and an upper reticent 167 extends upwardly from the support base 162. Each reticent 165, 167 is provided with a ramped surface 168, 170. Six slots 172 are arranged around the periphery of the support base 162.

[0022] On assembly, the first and second indicator wheels 141, 142, are received over the spigot 160 of the support base 162. The drum 144 is received within the central apertures of the two indicator wheels 141, 142. The helical coil 143 is received over spigot 160 with the key 164 of the spigot 160 engaging the key-way 157 of the lower ring 154 of the helical coil 143 so as to prevent relative rotation of the support base 162 and lower ring 154. The protrusions 156 of the upper ring 153 are slidably received in the longitudinal recesses 161 of the drum body 158. The guide arms 169 and flanges 170 act to retain the components in axial alignment.

[0023] The support 145 is inserted in the cylindrical portion 2 of the housing 1 such that the longitudinal ribs 14 are engaged in the notches 172 of the support base 162 so as to prevent relative rotation therebetween.

[0024] The support 145 is positioned lowdown with the lower components of the dosage counter being located between the support base 162 and the leading face 24 of the female 23.

[0025] In use, a user operates the pressurised dispensing container 20 by depressing the canister body 21 axially to move it relative to the cylindrical portion 2 of the housing 1. As a result, the valve stem 22 is inwardly retracted relative to the mating valve such that a dose of product is dispensed from the valve stem 22 into the bore 12 and duct 11 of the valve stem receiving block 9.

The product is then channelled by duct 11 through orifice 10 into the outlet duct 4. The aerosol is inhaled by a user inhaling on outlet 5 of the mouthpiece 3.

[0026] The support 145 is a push-fit within the cylindrical portion 2 of the housing 1 and does not move axially during a normal operating cycle. Axial movement of the leading face 24 of the female 23 is transmitted to the upper ring 153 of the helical coil 143. The upper and lower rings 153, 154 move towards each other and at the same time, due to the helical struts 155, the upper ring 153 rotates relative to the lower ring 154 which cannot rotate due to the engagement of the internal teeth 149, 152 with the external teeth 148, 151.

[0027] As the upper ring 153 rotates, it also rotates the drum 144 due to the engagement of the protrusions 156 in the longitudinal recesses 161. As shown in Figure 2, the drum is moved to rotate in an anticlockwise direction.

[0028] In the assembled position, the lower arms 150 of the drum 144 are aligned with the internal teeth 149 of the first indicator wheel 141. The upper arms 160 are partially aligned with the internal teeth 152 of the second

indicator wheel 142 and partially aligned with the upper half of the internal rim 200 of the first indicator wheel 141. Hence, the lower arms 150 are always engaged with the internal teeth 149 of the first indicator wheel 141 but the upper arms 160 are only held out of engagement with the internal teeth 152 of the second indicator wheel 142 due to the presence of the internal teeth 157 of the first indicator wheel 141.

[0029] Consequently, initially when the drum 144 rotates only the first indicator wheel 141 is incrementally rotated.

[0030] After successive rotations of the first indicator wheel 141, the upper arms 160 are brought into alignment with the radial notches 150 of the first indicator wheel 141. As a consequence, the upper arms 160 can flex radially outwards so as to engage the internal teeth 152 of the second indicator wheel 142. Consequently, the second indicator wheel 142 rotates one increment on the next actuation of the metering valve. In this way, the 'unit' indicia is incremented once for every ten increments of the 'tent' indicia.

[0031] On release of the canister body 21 by the user, the pressurised dispensing container 20 returns to its rest position due to the internal spring bias of the metering valve. At the same time, the helical coil 143 receives to its lower end the drum 144 which has rotated. The indicator wheels 141, 142 and the drum 144 are returned to their original positions.

[0032] The indicator wheels 141, 142, the helix-like coil 143 and the transmission means 144 are all held in place by the user or at the point of manufacture or sale, the leading face 24 of the female 23 initially axially moves the helical coil 143 without moving the support 145. Once the helical coil 143 has been completely compressed and the drum 144 incrementally rotated (during which movement the metering valve is actuated), the user, pharmaceutical or medical professional applies a higher axial force to the canister body 21 to move both the helical coil 143 and support 145 axially until the helix-like coil 143 is in contact with the 'ground' against the base of the receiving bore 12. The support 145 is now in its normal operating position and is 'set'. The setting of the support 145 takes into account any variations in distance between the leading face 24 of the female 23 and the end of the valve stem 22. Without this feature, it is possible for variations in pressurised dispensing containers to mean that in certain circumstances, the metering valve may be actuated before the first indicator wheel

141 rotates or vice versa.

Claims

- Apparatus comprising a housing (1) defining a portion (2) for receiving in use a dose-dispensing container (20) comprising a canister body (21), a drum (144) and a dose counter comprising at least one annular counter member (141, 142), a helix-like coil (143) and transmission means (144) for operatively connecting the helix-like coil (143) and the at least one annular counter member (141, 142), characterized in that movement of the received dose-dispensing container (20) acts to compress the helix-like coil (143) to thereby rotate the transmission means (144) and the at least one annular counter member (141, 142).
- Apparatus as claimed in claim 1 wherein the helix-like coil (143) comprises an upper ring (153), a lower ring (154) and at least one strut (155) spanning between the upper and lower rings (153, 154).
- Apparatus as claimed in claim 2 wherein the at least one strut (155) is helically shaped.
- Apparatus as claimed in any preceding claim wherein each of at least one annular counter members (141, 142) comprises a first series of teeth (148, 151; 149, 152), the transmission means (144) comprising protrusions (160, 159) selectively engageable with each of the first series of teeth such that rotational movement of the transmission means (144) causes the at least one annular counter member (141, 142) to rotate relative to the housing (1) in a first direction.
- Apparatus as claimed in claim 4 wherein the first series of teeth (149, 152) are formed around an inner rim of the at least one annular counter members (141, 142).
- Apparatus as claimed in any preceding claim wherein in the dose counter comprises two or more annular counter members (141, 142).
- Apparatus as claimed in claim 6 wherein the transmission means (144) comprises a drum (144) having the protrusion dependent therefrom, wherein one of the helix-like coil (143) and the drum (144) is mounted relative to the housing (1) and the other end of the coil (143) is engaged with the drum (144), such that movement of the received dose-dispensing container (20) compresses the helix-like coil (143) to thereby rotate the drum (144).
- Apparatus as claimed in claim 7 wherein one of the upper or lower rings (153, 154) of the helix-like coil (143) comprises at least one protrusion engageable in at

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- least one slot formed in the drum (144).
9. Apparatus as claimed in any of claims 8 to 8 wherein the first annular counter member (141, 142) is driven to incrementally rotate in the first direction on each actuation of the dose-dispensing container (20) and a second annular counter member (142, 141) is driven to incrementally rotate in the first direction only after a pre-determined number of incremental rotations of the first annular counter member (141, 142).
10. Apparatus as claimed in claim 9 wherein a bearing surface (150) is provided forming at least part of the inner rim (200) of the first annular counter member (141, 142) to selectively hold the drum protrusions (160) out of engagement with the first series of teeth (152) of the second annular counter member (142, 141), the bearing surface (150) comprising at least one indent allowing movement of the drum protrusions (160) radially outwardly into engagement with the first series of teeth (152) of the second annular counter member (142, 141) after a pre-determined number of incremental rotations of the first annular counter member (141, 142).
11. Apparatus as claimed in any preceding claim further comprising a support (146) selectively movable in the housing (1) so as to support the at least one annular counter member (141, 142), helix-flux coil (143) and transmission means (144) in proper alignment.
12. Apparatus as claimed in claim 11 wherein the support (146) is located in a lower end of the dose-dispensing container (20) receiving portion of the housing (1).
13. Apparatus as claimed in claim 12 wherein the support (146) comprises at least one ratchet (165, 167) engageable with a second series of teeth formed on each of the annular counter members (141, 142), so as to prevent rotation of the annular counter members (141, 142) in a direction opposed to the first direction.
14. Apparatus as claimed in any of claims 11 to 13 wherein a lens (174) is provided in the support.
- Patentschriftsprache
15. Vorrang nach einem der vorliegenden Ansprüche, wobei jedes der wenigstens einen Zahrelement (141, 142) umfasst, das einen inneren Rand des ringförmigen Zahrelementes (141, 142) herum gebildet ist.
16. Vorrang nach einem der vorliegenden Ansprüche, wobei der Dosiszähler (20) zu einem inneren Ende des wenigstens einen ringförmigen Zahrelementes (141, 142) herum gebildet ist.
17. Vorrang nach Anspruch 6, wobei das Übertragungsmittel (144) eine Trommel (144) umfasst, von welcher die Oberstände abhängen, wobei ein Ende der helizitären Spule (143) bezüglich des Gehäuses (1) drehbar befestigt ist, und wobei das andere Ende der Spule (143) mit der Trommel (144) eingreift, sodass eine Bewegung des aufgenommenen Dosis-ausgebenden Behälters (20) die helizitäre Spule (143) zusammen drückt, um dadurch die Trommel (144) zu drehen.
18. Vorrang nach Anspruch 7, wobei einer der oben genannten oder unteren Ringe (153, 154) der helizitären Spule wenigstens einen Oberstand umfasst, der in wenigstens einen in der Trommel (144) gebildeten Schlitz eingesetzt kann,
19. Vorrang nach einem der Ansprüche 8 bis 8, wobei ein erstes ringförmiges Zahrelement (141, 142)
- dung der helizitären Spule (143) und des wenigstens einen ringförmigen Zahrelementes (141, 142) auf demselben gedreht wird, dass die Bewegung des aufgenommenen Dosis-ausgebenden Behälters (20) bewirkt, dass die helizitäre Spule (143) zusammengedrückt wird, um dadurch das Übertragungsmittel (144) und das wenigstens eine ringförmige Zahrelement (141, 142) zu drehen.
20. Vorrang nach Anspruch 1, wobei die helizitäre Spule (143) einen oberen Ring (153), einen unteren Ring (154) und wenigstens eine Stufe (155) umfasst, die sich zwischen dem oberen und dem unteren Ring (153, 154) erstreckt.
21. Vorrang nach Anspruch 2, wobei die wenigstens eine Stufe (155) helizitär gebildet ist.
22. Vorrang nach einem der vorliegenden Ansprüche, wobei jedes der wenigstens einen Zahrelement (141, 142) eine erste Aufhängerfolge von Zähnen (148, 151; 149, 152) umfasst, wobei das Übertragungsmittel (144) Überstände (160, 159) umfasst, die selektiv mit jedem Zahn der ersten Aufhängerfolge von Zähnen (148, 151) eingreifen können, so dass eine Drehung des Übertragungsmittels (144) bewirkt, dass sich die wenigstens eine ringförmige Zahrelement (141, 142) bezüglich des Gehäuses (1) in einer ersten Richtung dreht.
23. Vorrang nach Anspruch 4, wobei die erste Aufhängerfolge von Zähnen (149, 152) um einen inneren Rand des wenigstens einen ringförmigen Zahrelementes (141, 142) herum gebildet ist.
24. Vorrang nach einem der vorliegenden Ansprüche, wobei der Dosiszähler (20) zu einem inneren Ende des wenigstens einen oder mehreren ringförmigen Zahrelementes (141, 142) umfasst.
25. Vorrang nach Anspruch 6, wobei das Übertragungsmittel (144) eine Trommel (144) umfasst, von welcher die Oberstände abhängen, wobei ein Ende der helizitären Spule (143) bezüglich des Gehäuses (1) drehbar befestigt ist, und wobei das andere Ende der Spule (143) mit der Trommel (144) eingreift, sodass eine Bewegung des aufgenommenen Dosis-ausgebenden Behälters (20) die helizitäre Spule (143) zusammen drückt, um dadurch die Trommel (144) zu drehen.
26. Vorrang nach Anspruch 7, wobei einer der oben genannten oder unteren Ringe (153, 154) der helizitären Spule wenigstens einen Oberstand umfasst, der in wenigstens einen in der Trommel (144) gebildeten Schlitz eingesetzt kann,
27. Vorrang nach einem der Ansprüche 8 bis 8, wobei ein erstes ringförmiges Zahrelement (141, 142)
- eingebaut ist, um sich bei jeder Bettigung des aufgenommenen Dosis-ausgebenden Behälters (20) schräg in die erste Richtung zu drehen, und wobei ein zweites ringförmiges Zahrelement (141, 142) angebracht ist, um sich nur nach einer vorbestimmten Anzahl von schrägwinkligen Drehungen des ersten ringförmigen Zahrelementes (141, 142) schräg in die ersten Richtung zu drehen.
28. Vorrang nach Anspruch 9, wobei ein Anteigatzer (150) vorgesehen ist, die wenigstens einen Teil des Innerrands (200) des ersten ringförmigen Zahrelementes (141, 142) bildet, um selektiv die Trommeloberfläche (160) aus dem Einflug mit der ersten Aufhängerfolge von Zähnen (152) des zweiten ringförmigen Zahrelementes herauszuhalten, wobei die Anteigatzer (150) wenigstens eine Varietät umfasst, welche die radial nach außen gerichtete Bewegung der Trommeloberfläche (160) in einen Eingriff mit der ersten Aufhängerfolge von Zähnen (148, 151; 149, 152) ermöglicht.
29. Vorrang nach einem der vorliegenden Ansprüche, welche eine Haltung (149) umfasst, die verschleißbar in dem Gehäuse (1) aufgenommen ist, um das wenigstens eine ringförmige Zahrelement (141, 142), die helizitäre Spule (143) und das Übertragungsmittel (144) in gezielter Ausrichtung zu halten.
30. Vorrang nach Anspruch 11, wobei die Haltung (149) wenigstens eine Spur (165, 167) umfasst, die mit einer an jedem der ringförmigen Zahrelementen (141, 142) gebildeten zweiten Aufhängerfolge von Zähnen eingreifen kann, um eine Drehung des ringförmigen Zahrelementes (141, 142) in einer der ersten Richtung entgegen gesetzter Richtung zu verhindern.
31. Vorrang nach Anspruch 12, wobei die Haltung (149) wenigstens eine Spur (165, 167) umfasst, die mit einer an jedem der ringförmigen Zahrelementen (141, 142) gebildeten zweiten Aufhängerfolge von Zähnen eingreifen kann, um eine Drehung des ringförmigen Zahrelementes (141, 142) in einer der ersten Richtung entgegen gesetzter Richtung zu verhindern.
32. Vorrang nach einem der Ansprüche 11 bis 13, wobei eine Linse (174) an der Haltung vorgesehen ist.
- Revendications
1. Appareil comprenant un boîtier (1) délimitant une portion (2) pour recevoir, à l'utilisation, un récipient de distribution de doses (20), le boîtier (1) contenant un compteur de doses comprenant au moins un élément de
2. Appareil selon la revendication 1, dans lequel la bobine de type hélice (143) et un moyen de transmission (144) pour relier fonctionnellement la bobine de type hélice (143) et l'autre moitié d'un élément de compteur annulaire (141, 142), caractérisée en ce que le mouvement du récipient de distribution de doses (20) reçu est à commander la bobine de type hélice (143) de faire tourner le moyen de transmission (144) et l'autre moitié un élément de compteur annulaire (141, 142).
3. Appareil selon la revendication 2, dans lequel l'autre moitié une entratole (165) à la forme d'une hélice.
4. Appareil selon l'une quelconque des revendications précédentes, dans lequel chaque au moins un élément de compteur annulaire (141, 142) comprend une première série de dents (148, 151; 149, 152), les deux extrémités de transmission (144) étant reliées aux saillies (160, 159) engageables sélectivement avec chaque dent de la première série de dents de manière que le mouvement modifié du moyen de transmission (144) amène l'autre moitié d'un élément de compteur annulaire (141, 142) à tourner par rapport au boîtier (1) dans une première direction.
5. Appareil selon la revendication 4, dans lequel la première série de dents (149, 152) est formée autour d'une bordure intérieure de l'autre moitié un élément de compteur annulaire (141, 142).
6. Appareil selon l'une quelconque des revendications précédentes, dans lequel le compteur de doses comprend au moins deux éléments de compteur annulaire (141, 142).
7. Appareil selon la revendication 5, dans lequel le moyen de transmission (144) comprend un tambour (144) ayant les saillies pendantes (160, 159), dans lesquelles sont engagées les saillies de type hélice (143) est l'autre moitié de l'élément de compteur annulaire (141, 142) et l'autre extrémité de la bobine (143) est engagée avec le tambour (144) de manière que le mouvement du récipient de distribution de doses reçu (20) commande la bobine de type hélice (143) afin de faire tourner le tambour (144).
8. Appareil selon la revendication 7, dans lequel l'anneau supérieur ou l'anneau inférieur (153, 154) de la bobine de type hélice comprend au moins une saillie engagable dans au moins une fente minérale dans le tambour (144).

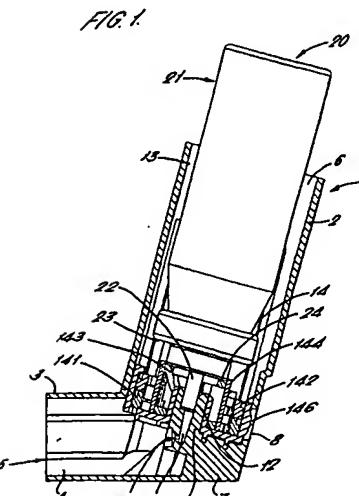
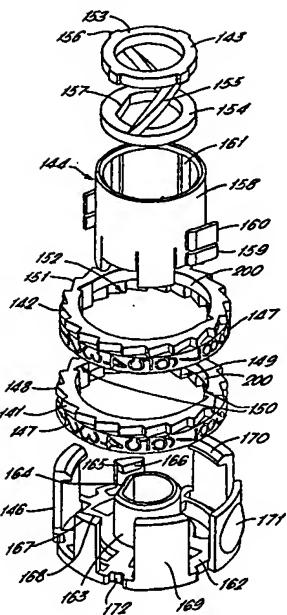


FIG. 2.



REFERENCES CITED IN THE DESCRIPTION

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